2004 GALVESTON BAY INVASIVE SPECIES RISK ASSESSMENT
INVASIVE SPECIES SUMMARY
Created by: Environmental Institute of Houston, University of Houston-Clear Lake
and the Houston Advanced Research Center

Species Name: Cabbage white butterfly

Latin Name: *Pieris rapae*

Category: Terrestrial Animal

Place of Origin: Europe

Place of Introduction: Quebec City (Canada). Gulf Coast, and Rocky Mountain states (United States) (http://creatures.ifas.ufl.edu/veg/leaf/imported_cabbageworm.htm).

Date of Introduction: 1860 (Canada), 1886 (United States) (http://creatures.ifas.ufl.edu/veg/leaf/imported_cabbageworm.htm).

Life History: "The complete life cycle of this insect requires three to six weeks, depending on weather. The number of generations reported annually is two to three in Canada, three in the New England states, three to five in California, and six to eight in the south. Imported cabbageworm can be found throughout the year in Florida.

Egg: Eggs are laid singly, usually on the lower surface of outer leaves of plants.

Larva: There are five instars. The larva requires about 15 days (range 11 to 33 days) to complete its development during August. Average (and range) of development times for each instar at 19 degrees C was observed to be 4.5 (2.5-6), 3.0 (1.5-5), 3.3 (2-5), 4.1 (3-6.5), and 7.8 (5-18) days, respectively.

Pupa: Pupation normally occurs on the food plant, but cabbageworm may pupate in nearby debris. Pupation during the summer generations lasts about 11 days. The chrysalis is the overwintering stage, however, so its duration may be prolonged for months. The proportion of pupae that diapause increases as autumn progresses, so that at the time of the final generation all pupae are in diapause.

Adult: The adult typically lives about three weeks. The female produces 300-400 eggs. The adult is very active during the daylight hours, often moving from the crop to flowering weeds to feed (http://creatures.ifas.ufl.edu/veg/leaf/imported_cabbageworm.htm)."

Growth/Size: Egg: 0.5 mm – 1.0 mm. **Larvae:** see Physical Description**. Pupa**: 18-20 mm. **Adult:** 4.5 – 6.5 cm (http://creatures.ifas.ufl.edu/veg/leaf/imported_cabbageworm.htm).

Feeding Habits/Diet: "Larvae of this insect feed widely on plants in the family Cruciferae, but occasionally on a few other plant families that contain mustard oils. Commonly attacked are vegetable crops such as broccoli, Brussels sprouts, cabbage, cauliflower, collard, horseradish, kale, and kohlrabi. Also sometimes attacked are flowers such as nasturtium and sweet alyssum, and weeds in the family Cruciferae. Adults sip nectar from flowers, and are commonly seen feeding at a number of plants (http://creatures.ifas.ufl.edu/veg/leaf/imported_cabbageworm.htm)."

Habitat: Temperate regions around the world (http://creatures.ifas.ufl.edu/veg/leaf/imported_cabbageworm.htm)

Attitude (aggressive, etc.): "Cabbageworms feed on foliage, and if left unchecked often will reduce mature plants to stems and large veins. Although they prefer leafy foliage, larvae may burrow into the heads of broccoli and cabbage, especially as they mature. Larvae are often immobile, and difficult to dislodge, and may be overlooked when cleaning produce. Larvae produce copious quantities of fecal material which also contaminate and stain produce (http://creatures.ifas.ufl.edu/veg/leaf/imported_cabbageworm.htm)."

Physical Description: "**Egg:** The egg measures 0.5 mm in width and 1.0 mm in length, and initially is pale white in color but eventually turns yellowish. The egg is laid on end, with the point of attachment flattened and the distal end tapering to a blunt point. The shape is sometimes described as resembling a bullet.

Larvae: The larva is green, velvety in appearance, and bears five pairs of prolegs. There are five instars. Head capsule widths are about 0.4, 0.6, 0.97, 1.5, and 2.2 mm, respectively. Body lengths at maturity of each instar averages 3.2, 8.8, 14.0, 20.2, and 30.1 mm, respectively. All larval stages except the first instar bear a narrow yellow line running along the center of the back; this stripe is sometimes incomplete on the early instars. A broken yellow line, or series of yellow spots, also occurs on each side.

Pupa: The chrysalis is about 18 to 20 mm in length, and varies in color, usually yellow, gray, green and speckled brown. A sharply angled, keel-like projection is evident dorsally on the thorax, and dorsolaterally on each side of the abdomen. At pupation, the chrysalis is anchored by the tip of the abdomen to the silk pad, and a strand of silk is loosely spun around the thorax.

Adult: Upon emergence from the chrysalis the butterfly has a wing span of about 4.5 to 6.5 cm. It is white above with black at the tips

of the forewings. The front wings are also marked with black dots: two in the central area of each forewing in the female, and one in case of males. When viewed from below, the wings generally are yellowish, and the black spots usually show faintly through the wings. The hind wing of each sex also bears a black spot on the anterior edge. The body of the butterfly is covered with dense hair, which is colored white in females, but darker in males (http://creatures.ifas.ufl.edu/veg/leaf/imported_cabbageworm.htm)."

Management Recommendations / Control Strategies: include references for existing site-specific strategies

"Sampling: Harcourt (1962) studied the distribution of imported cabbageworm on crops. He suggested that one-half of each plant be examined visually for various stages. Recommended sample sizes were 20 plants for eggs, 30 for young larvae, 40 for mid-age larvae, 50 for large larvae, and 70 for pupae. Larvae often rest along the principal leaf vein, and are very difficult to see, because their body color closely matches the background. The presence of butterflies, which are highly visible, suggests future problems.

Insecticides: Imported cabbageworm are readily killed by foliar application of insecticides, including the bacterial insecticide *Bacillus thuringiensis*. Botanical insecticides are fairly effective against cabbageworm, although dust formulations seem to be superior to aqueous sprays .

Biological control: Several microbes have been investigated for control of imported cabbageworm, and have the potential to be developed as microbial insecticides. The imported cabbageworm granulosis virus (*Pieris rapae* GV) suppressed cabbageworm larvae in the laboratory and in a field test, but required four to 10 days to inflict mortality and was not superior to control provided by *Bacillus thuringiensis*. Home gardeners sometimes collect dying virus- infected caterpillars, macerate them in water, and spray the suspension onto cabbages as a home-made biological insecticide

Host plant resistance: Crucifer crops differ is their susceptibility to attack by imported cabbageworm. Chinese cabbage, turnip, mustard, rutabaga, and kale are less preferred than cabbage, collards, Brussels sprouts, broccoli, and cauliflower. Some cultivars of certain crops also have moderate levels of resistance to infestation by imported cabbageworm. One resistance character is due to, or correlated with, dark green, glossy leaves. This character imparts resistance to imported cabbageworm and other caterpillars, but increases susceptibility to flea beetle injury (Dickson and Eckenrode 1980). The red color found in many crucifer varieties also affects imported cabbageworm. Cabbage butterflies avoid ovipositing on red cabbage varieties (Radcliffe and Chapman 1966). However, larval survival is favored by red cabbage. Thus, while important genetic material has been identified, in most cases existing varieties are not a practical solution to caterpillar problems.

Cultural practices: Paper caps early in the season, and row covers later, are effective in preventing oviposition by imported cabbageworm butterflies (http://creatures.ifas.ufl.edu/veg/leaf/imported_cabbageworm.htm)."

References (includes journals, agency/university reports, and internet links):

1. http://creatures.ifas.ufl.edu/veg/leaf/imported_cabbageworm.htm

2. Dickson, M.H. and C.J. Eckenrode. 1980. Breeding for resistance in cabbage and cauliflower to cabbage looper, imported cabbageworm, and diamondback moth. J. Am. Soc. Hort. Sci. 105:782-785.

3. http://66.36.161.27/insects/top_list/list.php3?gate=n. This site is designed and maintained by Bill Oehlke. You can reach Bill for questions by clicking on his name (email) or by phone 902-838-3455, by fax 902-838-0866, or at Bill Oehlke, Box 476, Montague, P.E.I., Canada C0A 1R0.

4. http://www.npwrc.usgs.gov/resource/distr/lepid/bflyusa/bflyusa.htm Version 26JUN2002). Opler, Paul A., Harry Pavulaan, and Ray E. Stanford (coordinators). 1995. Butterflies of North America. Jamestown, ND: Northern Prairie Wildlife Research Center Home Page.

Available Mapping Information:

Opler, Paul A., Harry Pavulaan, and Ray E. Stanford (coordinators). 1995. Butterflies of North America. Jamestown, ND: Northern Prairie Wildlife Research Center Home Page.http://www.npwrc.usgs.gov/resource/distr/lepid/bflyusa/bflyusa.htm Version 26JUN2002).